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ABSTRACT

This paper describes a framework for research in Information Systems/Information Technology (IS/IT) instruction that is grounded in existing theory and research from education literature. A recently developed model that integrates instructional design and learning motivation theories provides a theoretical basis for future efforts of researchers and practitioners in IS/IT instruction. Primary theories of instructional design and learning motivation are reviewed; a detailed description of the integrative model is provided, focusing on instructional methods, learner motivation, instructional conditions, and outcomes. Finally, implications for research and practice in IS/IT instruction are drawn from the integrative model. (AEF)

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A CONCEPTUAL FRAMEWORK FOR RESEARCH IN IS/IT INSTRUCTION

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An integrative model of instructional design and learner motivation (drawn from the education research literature) provides a theory-based conceptual framework for research efforts in IS/IT instruction. The components and linkages of the integrative model are reviewed. The model elucidates issues in instruction that have, heretofore, received little attention from researchers in IS/IT instruction and encourages consideration of those elements in future research.

INTRODUCTION

The present effort was undertaken to identify a framework for research in IS/IT instruction that is grounded in existing theory and research from the education literature. An examination of theory and research in higher education revealed a model that integrates instructional design and learner motivation theories. The model is a promising one that can provide a theoretical basis for future efforts of researchers and practitioners in IS/IT instruction.

This paper begins with a brief review of the primary theories of instructional design and learner motivation. This is followed by a detailed review of a recently developed model that integrates instructional design and learner motivation theories. Finally, implications for research and practice in IS/IT instruction are drawn from the integrative model.

INSTRUCTIONAL DESIGN THEORY

The instructional design literature provides a body of knowledge that prescribes actions to optimize desired instructional outcomes, such as student achievement and affect. Compared to curriculum theory, which is concerned with what to teach, instructional design theory deals with how to teach it (Snelbecker, 1985). Instructional design has long been viewed as the "linking science" between learning theory and the practice of instruction (Dewey, 1913; Reigeluth, 1983).

According to Reigeluth (1983), a theory of instruction consists of three major components: instructional methods, instructional conditions, and instructional outcomes. The relationships proposed to exist among these components are shown in Figure 1. The methods in Reigeluth's theoretical framework are specific strategies an instructor can employ in organizing, delivering, and managing the course. Conditions refer to those variables, such as learner characteristics, that constrain or interact with instructional methods and typically cannot be manipulated by the instructor. Outcomes include the influences of instruction and are usually measures of student achievement and student affect.

LEARNER MOTIVATION THEORY

Instructional design is intended to be learner-centered (Edmonds, Branch, & Mukherjee, 1994) and recent authors have suggested that learner motivation is at the very core of our understanding of course outcomes (Bigge & Hunt, 1980; Keller, 1979; Keller & Kopp, 1987). For many years, however, learner motivation was not a specified variable in instructional design theory. Keller's (1983, 1984) educational model

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for designing motivating instruction addressed this limitation and confirmed the importance of student beliefs and perceptions in educational contexts.

More specifically, Keller (1983) proposed a model that defined learner motivation as a function of attention (A), relevance (R), confidence (C), and satisfaction (S), or "ARCS" as it has become commonly known. Attention refers to the degree to which course content arouses and maintains learner interest. Relevance reflects the learner's perception of the extent to which the course content relates to important personal goals. Confidence represents the learner's expectancy for success. Finally, satisfaction is concerned with the extent to which the learner experiences positive consequences in the instruction. A fundamental tenet of the model is that the four components are necessary conditions for students to become and remain maximally motivated to learn. Keller's work is grounded in theories of expectancy and social learning and has been used extensively for prescribing instructional strategies that are likely to enhance the motivational quality of instruction (e.g., Bohlin, Milheim, & Viechnicki, 1993; Main, 1993; Pearson & Carey, 1995; Small & Gluck, 1994).

AN INTEGRATIVE MODEL

For over a decade, a gap in the instructional literature was the integrating link between learner motivation theory and instructional design theory. Moore, Burke, and Baldwin (1997) recently developed an integrative model of instructional design and learner motivation. In their integrative model, learner motivation is proposed to partially mediate the effects of instructional methods and conditions on instructional outcomes.

The detailed model developed by Moore et al. (1997) is shown in Figure 2. The model reflects the relationships proposed to exist among learner motivation and instructional design components in the general context of higher education. In the following sections, each of the components in the model is reviewed.

Instructional Methods

Instructional methods encompass the different ways that different outcomes can be achieved under different conditions. Reigeluth and Merrill (1979) identified three types of instructional method variables: organizational strategies, delivery strategies, and management strategies. Organizational strategies are methods of organizing the subject matter content selected for instruction (e.g., decisions regarding the sequencing and synthesizing of content and the use of alternative representations or examples). Delivery strategies are methods for conveying the instruction to the learner and/or for receiving and responding to input from the learner (e.g., characteristics of the media, teachers, and textbooks). Management strategies are methods for making decisions about when to use certain organizational and delivery strategy components in the course (e.g., decisions regarding how to individualize the instruction and when to use a particular communication or presentation medium). In addition, Moore et al. (1997) proposed a fourth type of instructional method variable -- evaluation strategies. Evaluation strategies encompass decisions and practices related to the design and administration of the course policy for the evaluation of student performance.

Learner Motivation

The learner motivation component of the model encompasses the learner's attention to the course (A), perception of the relevance of the course (R), confidence that he or she can succeed in the course (C), effort, and satisfaction or experience of positive consequences in the course (S). Based on Keller's (1983) theory of learner motivation, the learner attitudes and beliefs associated with attention, relevance, and confidence (A, R, and C) will influence the learner's effort in the learning experience. The learner's effort, and the consequences associated with that effort, will affect the level of satisfaction (S) experienced by the learner.

Instructional Conditions

Reigeluth (1983) identified two categories of instructional conditions: characteristics of the subject matter and characteristics of the student. The study by Biglan (1973) continues to be the primary source of insight into characteristics of subject matter commonly taught in higher education. Biglan identified three dimensions on which subject matter could be classified: (1) the extent to which paradigms exist to specify the

appropriate problems for study and the appropriate methods to be used (also referred to by Biglan as "hard" vs. "soft" areas of study); (2) the extent of attention to practical application (also referred to by Biglan as "pure" vs. "applied" areas of study); (3) the extent of concern with life systems.

The research literature reveals the following student characteristics that can influence instructional outcomes: the knowledge, skills, and abilities the student brings to the learning program (e.g., Cronbach & Snow, 1977); the student's personal interests and goals (Keller, 1983); student attitudes toward college coursework (e.g., Eison, 1981). A more detailed review of the literature in student and subject matter characteristics, as well as a consideration of the roles they may play in IS/IT instruction, is provided in the full paper.

Instructional Outcomes

Instructional outcomes generally encompass the appeal, effectiveness, and efficiency of the instruction (Reigeluth, 1983). Appeal of the instruction is usually measured as student affect related to the course experience and/or the student's desire to continue learning. Effectiveness of the instruction is typically operationalized as measures of student achievement. Efficiency of instruction is traditionally assessed as effectiveness divided by "costs" (e.g., student time, teacher time, design and development expenses, etc.).

IMPLICATIONS FOR RESEARCH AND PRACTICE

The integrative model elucidates variables that influence instructional outcomes and, hence, are likely to be of particular interest to IS/IT researchers and practitioners. In general, the model provides a framework by which to view the design and delivery of IS/IT instructional techniques and exercises, as well as their outcomes and associated boundary conditions. For example, the use of Web-based instruction in the teaching of a particular topic can be viewed through this model. The model elucidates important variables (e.g., student characteristics, learner motivation, effectiveness and appeal of instruction) that should be assessed to better understand the outcomes of Web-based instruction and the boundary conditions under which positive outcomes are achieved.

In addition, the model draws the attention of researchers and practitioners to the role of student and subject matter characteristics in instruction. While teachers are likely to agree that instructional methods directly affect instructional outcomes and learner motivation, the model reminds us that student and subject matter characteristics often moderate these effects. That is, a particular method for teaching a particular IS/IT topic may be effective for a certain type of student (e.g., traditional undergraduate students who are relatively young and deficient in work experience) but may be ineffective for other types of students.

Furthermore, the integrative model provides a general framework by which to address issues regarding the instructional use of communication and presentation media. Decisions related to media usage are encompassed in the instructional methods component of the model, and the model reminds us that the influence of media usage on learner motivation and instructional outcomes is likely to be moderated by characteristics of the students and subject matter. Hence, researchers are encouraged to incorporate these variables in future instructional media research.

In the area of instructional outcomes, "efficiency" of the instruction may strike a chord with IS/IT instructors. Efficiency of instruction is defined in the education literature as effectiveness divided by teacher time and expenses related to design, development, and delivery of the instruction (Reigeluth, 1983). Evolving technologies challenge IS/IT educators to keep up with the latest advances and to incorporate emerging technologies into their classroom instruction. However, it is likely that, due to limits on instructor time and other resources, all evolving technologies cannot be effectively incorporated.

Hence, the IS/IT instructor is faced with decisions regarding which technologies and emerging topics to incorporate. Whereas IS/IT instructors have long considered and assessed the effectiveness and appeal of their instructional

strategies, the instructional design literature validates our need to also consider the efficiency of instruction. In making decisions concerning the potential incorporation of various technologies and emerging topics in a particular IS/IT course, an instructor is encouraged to consider the efficiency of each (i.e., the incremental increase in effectiveness of instruction divided by instructor time and other expenses associated with its incorporation). This is also an interesting area for future empirical study. Accordingly, researchers are encouraged to investigate questions such as "what is the increase in effectiveness (student achievement of the course objectives) relative to costs (teacher time and other expenses) associated with the use of a particular instructional method for a particular segment of IS/IT subject matter?"

Finally, the integrative model may also provide a theoretical foundation for the design and delivery of end user training. The elements of methods, learner motivation, student characteristics, subject matter characteristics, and instructional outcomes, and the relationships among these elements, are likely to be as crucial in corporate training as they are in the context of higher education. Thus, the model elucidates critical elements to be considered in the design and delivery of end user training, and provides a conceptual framework for further research in this area.

CONCLUSION

A model drawn from research in instructional design and learner motivation was identified in this paper as a promising conceptual framework for research being conducted in IS/IT instruction. In addition, new and important areas for research in IS/IT instruction were elucidated by the model and discussed.

It is hoped that, by bringing this model to the attention of IS/IT researchers and practitioners, future efforts in IS/IT instruction will benefit from more extensive grounding in educational theory. More specifically, by examining IS/IT instructional issues within this framework, researchers should be more likely to incorporate additional variables that influence instructional outcomes and, hence, should arrive at more fully specified models. Ultimately, the goal of researchers and practitioners in IS/IT instruction is to identify instructional methods that, for types of subject matter and students commonly encountered, will increase the effectiveness of instruction. The model reviewed in this paper provides a conceptual framework to support such efforts.

NOTE: Figures and references are available upon request from the primary author.